

09/744180

JC03 Rec'd PCT/PTO

19 JAN 2001

Practitioner's Docket No. 297-010084-US(PAR)

CHAPTER II

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P., § 601, 7th ed.

**TRANSMITTAL LETTER
TO THE UNITED STATES ELECTED OFFICE (EO/US)
(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)**

INTERNATIONAL APPLICATION NO. PCT/FI99/00636	INTERNATIONAL FILING DATE 22 July 1999	PRIORITY DATE CLAIMED 23 July 1998
TITLE OF INVENTION A METHOD AND AN ARRANGEMENT FOR MANAGEMENT OF BEARERS		
APPLICANT(S) Jari HARTIKAINEN, Timo PERALA, Pekka MARJELUND, Pekka KOHONEN, Timo KAUKANEN		

Box PCT
Assistant Commissioner for Patents
Washington D.C. 20231
ATTENTION: EO/US

CERTIFICATION UNDER 37 C.F.R. § 1.10*
(Express Mail label number is mandatory.)
(Express Mail certification is optional.)

I hereby certify that this Transmittal Letter and the papers indicated as being transmitted therewith is being deposited with the United States Postal Service on this date 19 January 2001, in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number FI 6274247641US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Debra G. Conrad

(type or print name of person mailing paper)

Debra G. Conrad

Signature of person mailing paper

WARNING: Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

***WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).

"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will not be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 1 of 8)

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NOTE: To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the International Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1.495.

WARNING: Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R. § 1.8).

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111, 37 C.F.R. § 1.494(f).

i. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:

- a. ☒ This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).
- b. ☒ The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

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2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
<input type="checkbox"/> *	TOTAL CLAIMS				
	20	20 -20=	0	× \$18.00=	\$ 0
	INDEPENDENT CLAIMS				
	3	3 -3=	0	× \$80.00	0
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+ \$270.00
BASIC FEE**	<input type="checkbox"/> U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an international preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: <input type="checkbox"/> and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4))\$100.00 <input type="checkbox"/> and the above requirements are not met (37 C.F.R. § 1.492(a)(1))\$690.00 <input checked="" type="checkbox"/> U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: <input type="checkbox"/> has been paid (37 C.F.R. § 1.492(a)(2)) \$710.00 <input type="checkbox"/> has not been paid (37 C.F.R. § 1.492(a)(3))\$1,000. <input checked="" type="checkbox"/> where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) \$860.00				860.00
	Total of above Calculations				= 860.00
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (note 37 C.F.R. § 1.9, 1.27, 1.28)				-
	Subtotal				
	Total National Fee				\$ 860.00
	Fee for recording the enclosed assignment document \$40.00 (37 C.F.R. § 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				
TOTAL	Total Fees enclosed				\$ 860.00

*See attached Preliminary Amendment Reducing the Number of Claims.

- i. ☒ A check in the amount of \$860.00 to cover the above fees is enclosed.
ii. ☐ Please charge Account No. _____ in the amount of \$ _____.
A duplicate copy of this sheet is enclosed.

****WARNING:** "To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: * * * (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).

WARNING: If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office, 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(f) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.

3. ☒ A copy of the international application as filed (35 U.S.C. § 371(c)(2)):

NOTE: Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.

- a. ☐ Is transmitted herewith.
b. ☐ is not required, as the application was filed with the United States Receiving Office.
c. ☒ has been transmitted
i. ☒ by the International Bureau.
Date of mailing of the application (from form PCT/1B/308): 2/3/2000
ii. ☐ by applicant on _____
Date

4. ☒ A translation of the international application into the English language (35 U.S.C. § 371(c)(2)):

- a. ☒ is transmitted herewith.
b. ☐ is not required as the application was filed in English.
c. ☐ was previously transmitted by applicant on _____
Date
d. ☐ will follow.

5. ☒ Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

- a. ☐ are transmitted herewith.
- b. ☐ have been transmitted
 - i. ☐ by the International Bureau.
Date of mailing of the amendment (from form PCT/1B/308): _____
 - ii. ☐ by applicant on (date) _____
Date
- c. ☒ have not been transmitted as
 - i. ☒ applicant chose not to make amendments under PCT Article 19.
Date of mailing of Search Report (from form PCT/ISA/210): 5/11/1999
 - ii. ☐ the time limit for the submission of amendments has not yet expired.
The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. ☒ A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. § 371(c)(3)):
- a. ☐ is transmitted herewith.
 - b. ☐ is not required as the amendments were made in the English language.
 - c. ☒ has not been transmitted for reasons indicated at point 5(c) above.
7. ☒ A copy of the International examination report (PCT/IPEA/409)
- ☒ is transmitted herewith.
 - ☐ is not required as the application was filed with the United States Receiving Office.
8. ☐ Annex(es) to the international preliminary examination report
- a. ☐ is/are transmitted herewith.
 - b. ☐ is/are not required as the application was filed with the United States Receiving Office.
9. ☐ A translation of the annexes to the international preliminary examination report
- a. ☐ is transmitted herewith.
 - b. ☐ is not required as the annexes are in the English language.

10. ☒ An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115

- a. ☐ was previously submitted by applicant on _____
Date
- b. ☐ is submitted herewith, and such oath or declaration
- i. ☐ is attached to the application.
- ii. ☐ identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.
- iii. ☒ will follow.

II. Other document(s) or information included:

11. ☒ An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):

- a. ☒ is transmitted herewith.
- b. ☐ has been transmitted by the International Bureau.
Date of mailing (from form PCT/IB/308): _____
- c. ☐ is not required, as the application was searched by the United States International Searching Authority.
- d. ☐ will be transmitted promptly upon request.
- e. ☐ has been submitted by applicant on _____
Date

12. ☒ An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:

- a. ☒ is transmitted herewith.
Also transmitted herewith is/are:
☒ Form PTO-1449 (PTO/SB/08A and 08B).
☒ Copies of citations listed.
- b. ☐ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).
- c. ☐ was previously submitted by applicant on _____
Date

13. ☐ An assignment document is transmitted herewith for recording.

A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

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14. ☒ Additional documents:

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- a. ☒ Copy of request (PCT/RO/101)
- b. ☒ International Publication No. W0 00/05913
- i. ☐ Specification, claims and drawing
- ii. ☒ Front page only
- c. ☒ Preliminary amendment (37 C.F.R. § 1.121)
- d. ☒ Other
PCT/IB/304, PCT/IB/306, PCT/IB/308, PCT/IPEA/402, PCT/IPEA/408,
PCT/IPEA/416, PCT/IPEA/409, Finnish Search Report

15. ☒ The above checked items are being transmitted

- a. ☒ before 30 months from any claimed priority date.
- b. ☐ after 30 months.

16. ☐ Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on _____, namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

- ☒ The Commissioner is hereby authorized to charge the following additional fees that may be required by this paper and during the entire pendency of this application to Account No. 16-1350.

- ☒ 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.

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☒ 37 C.F.R. § 1.492(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

☒ 37 C.F.R. § 1.17 (application processing fees)☐ 37 C.F.R. § 1.17(a)(1)-(5) (extension fees pursuant to § 1.136(a).☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

☒ 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).

PLEASE SEND ALL CORRESPONDENCE TO:


 SIGNATURE OF PRACTITIONER

Reg. No.: 24,622

Clarence A. Green

Tel. No.: (203) 259-1800

(type or print name of practitioner)

PERMAN & GREEN, LLP

Customer No.: 2512

P.O. Address

425 Post Road, Fairfield, Connecticut 06430, USA

PLEASE SEND ALL CORRESPONDENCE TO:

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

09/744100

JC07 Rec'd PCT/PTO 1.9 JAN 2001

Express Mail No.: EL627424764US

In re Application of: HARTIKAINEN et al.

International Application No.:PCT/FI99/00636

International Filing Date: 22 July 1999

FILING DATE: Herewith

ART UNIT:

TITLE: A METHOD AND AN ARRANGEMENT FOR MANAGEMENT OF
BEARERS

ATTORNEY DOCKET NO.: 297-010084-US(PAR)

Box PCT

The Commissioner of Patents and Trademarks
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

Please amend the above-identified, enclosed patent application as follows:

IN THE CLAIMS:

Please amend Claims 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 17 and 20 as shown below.

Claim 4, line 1, delete "any of the preceding Claims" and insert --Claim 1--.

Claim 5, line 1, delete "any of the preceding Claims" and insert --Claim 1--.

Claim 6, line 1, delete "any of the preceding Claims" and insert --Claim 1--.

Claim 8, line 1, delete "or 7".

Claim 9, line 1, delete "any of the preceding Claims" and insert --Claim 1--.

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Claim 10, line 1, delete "any of the preceding Claims" and insert --Claim 1--.

Claim 11, line 1, delete "or 10".

Claim 12, line 1, delete "or 10".

Claim 13, line 1, delete "any of the preceding Claims" and insert --Claim 1--.

Claim 14, line 1, delete "any of the preceding Claims" and insert --Claim 1--.

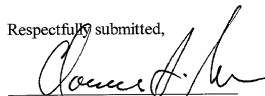
Claim 17, line 1, delete "or 16".

Claim 20, line 1, delete "or 19".

Remarks

Please enter this preliminary amendment prior to calculation of the fees.

Respectfully submitted,



Clarence A. Green, Reg. No. 24,622

Perman & Green, LLP

425 Post Road

Fairfield, CT 06430

(203) 259-1800



Date

A method and an arrangement for management of bearers**TECHNICAL FIELD OF THE INVENTION**

The invention is directed to a method and an arrangement for management of bearers in cellular telecommunication systems in such a situation, when the demand of services is greater than the capacity of the network to provide such services.

BACKGROUND OF THE INVENTION

For clarification of common terms used in this document, an overview of certain cellular telecommunication system configurations is presented in the following.

Proposals for third-generation systems include UMTS (Universal Mobile Telecommunications System) and FPLMTS/IMT-2000 (Future Public Land Mobile Telecommunications System / International Mobile Telecommunications at 2000 MHz). In these plans cells are categorised according to their size and characteristics into pico-, nano-, micro- and macrocells, and an example of the service level is the bit rate. The bit rate is the highest in picocells and the lowest in macrocells. The cells may overlap partially or completely and there may be different terminals so that not all terminals necessarily are able to utilise all the service levels offered by the cells.

Fig. 1 shows a version of a future cellular radio system which is not entirely new compared with the known GSM system but which includes both known elements and completely new elements. In current cellular radio systems the bottleneck that prevents more advanced services from being offered to the terminals comprises the radio access network RAN which includes the base stations and base station controllers. The core network of a cellular radio system comprises mobile services switching centres (MSC), other network elements (in GSM, e.g. SGSN and GGSN,

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i.e. Serving GPRS Support Node and Gateway GPRS Support node, where GPRS stands for General Packet Radio Service) and the related transmission systems. According e.g. to the GSM+ specifications developed from GSM the core network can also provide new services.

In Fig. 1, the core network of a cellular radio system 930 comprises a core network CN 931 which has three parallel radio access networks linked to it. Of those, networks 932 and 933 are UMTS radio access networks and network 934 is a GSM radio access network. The upper UMTS radio access network 932 is e.g. a commercial radio access network, owned by a telecommunications operator offering mobile services, which equally serves all subscribers of said telecommunications operator. The lower UMTS radio access network 933 is e.g. private and owned e.g. by a company in whose premises said radio access network operates. Typically the cells of the private radio access network 933 are nano- and/or picocells in which only terminals of the employees of said company can operate. All three radio access networks may have cells of different sizes offering different types of services. Additionally, cells of all three radio access networks 932, 933 and 934 may overlap either entirely or in part. The bit rate used at a given moment of time depends, among other things, on the radio path conditions, characteristics of the services used, regional overall capacity of the cellular system and the capacity needs of other users. The new types of radio access networks mentioned above are called generic radio access networks (GRAN). Such a network can co-operate with different types of fixed core networks CN and especially with the GPRS network of the GSM system. The generic radio access network (GRAN) can be defined as a set of base stations (BS) and radio network controllers (RNC) that are capable of communicating with each other using signaling messages. Below, the generic radio access network will be called in short a radio network GRAN.

The terminal 935 shown in Fig. 1 is preferably a so-called dual-mode terminal that can serve either as a second-generation GSM terminal or as a third-generation

UMTS terminal according to what kind of services are available at each particular location and what the user's communication needs are. It may also be a multimode terminal that can function as terminal of several different communications systems according to need and the services available. Radio access networks and services available to the user are specified in a subscriber identity module 936 (SIM) connected to the terminal.

In UMTS specifications, a SIM is denoted with the term USIM (UMTS SIM). One mobile communication means (ME, mobile equipment) such as a cellular telephone can have more than one USIM connected to the terminal. This is useful, for example, for providing a person with a private telephone number with a first USIM and another number for work-related calls with a second USIM. The person can then receive calls to all of these telephone numbers with the same ME comprising the two USIMs, and bar any calls to any of these telephone numbers at his/her leisure. For example, the person can bar any calls to the work-related number at weekends and allow only calls to his/her private number. The USIMs may be separate IC cards, whereby the ME is required to have more than one USIM connector for connecting the USIMs, or a single IC card may comprise more than one logical USIMs.

In cellular telecommunication systems a single speech connection or data connection through the cellular telecommunication network is called a bearer. Generally, a bearer is associated with a set of parameters pertaining to data communication between a certain terminal equipment and a network element, such as a base station or an interworking unit (IWU) connecting the cellular network to another telecommunications network. The set of parameters associated with a bearer comprises typically for example data transmission speed, allowed delays, allowed bit error rate (BER), and the minimum and maximum values for these parameters. A bearer may further be a packet transmission bearer or a circuit switched bearer and support for example transparent or non-transparent connections. A bearer can be

thought of as a data transmission path having the specified parameters connecting a certain mobile terminal and a certain network element for transmission of payload information. One bearer always connects only one mobile terminal to one network element. However, a bearer can pass through a number of network elements. One mobile communication means (ME, Mobile Equipment) may in some cellular telecommunication systems support one bearer only, in some other systems also more than one simultaneous bearers.

One old problem in cellular telecommunication systems is how to handle situations, in which the demand of services at some area in a cellular telecommunication system exceeds the capability of the cellular telecommunication system to provide such services. This problem is more severe in the UMTS system presently under development and other systems, where a mobile communication means (ME) can have more than one simultaneous connections i.e. bearers. A method is needed for determining, which current bearers are dropped or which new bearers are allowed in an overload situation.

One example of a typical overload situation is the handover of a connection to a crowded cell. One conventional way of handling this situation is simply to refuse the handover, which may result in a broken connection. The situation is more complicated, if the ME has several connections, and the new cell has spare capacity for only a subset of those connections. In such a situation, a method is needed for selecting which connections are serviced and which connections are refused.

One further example of a problematic situation is such a situation, when the capacity of a cell is already in full use, and one ME requests for example an increase in data transmission rate or a group of new bearers.

SUMMARY OF THE INVENTION

An object of the invention is to alleviate problems associated with cell overload situations. A further object of the invention is to realize a method for selection of bearers, which are to be denied of service in an overload situation. An object of the invention is also to realize a method for prioritizing of bearers.

The objects are reached by defining a multilevel priority scheme for bearers, which allows flexible allocation of resources for bearers having widely differing parameters.

The method according to the invention for management of bearers in a cellular telecommunications system is characterized by that

- at least two priority data items are associated with each bearer, and
- decisions whether or not to provide services for a bearer are based at least in part on the value of at least one of said at least two priority data items.

The cellular telecommunications system according to the invention is characterized by that for management of bearers

- at least two priority data items are arranged to be associated with each bearer, and
- decisions whether or not to provide services for a bearer are arranged to be based at least in part on the value of at least one of said at least two priority data items.

A radio network controller according to the invention for a cellular telecommunications system is characterized by that for management of bearers it comprises

- means for associating at least two priority data items with each bearer, and
- means for making decisions whether or not to provide services for a bearer based at least in part on the value of at least one of said at least two priority data items.

The dependent claims describe further advantageous embodiments of the invention.

The invention relates to alleviating problems in those situations, where a radio access network cannot support all present or requested bearers. According to the invention, a set of priority values is associated with each bearer. Preferably, the set of priority values comprises an absolute priority value, which is the same for all bearers associated with a certain USIM, and a relative priority value, which defines the priority order of the bearers associated with a certain USIM. The network uses these priority values to determine, which bearer is dropped, when not enough resources are available.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in more detail in the following with reference to the accompanying drawings, of which

Figure 1 illustrates the general structure of a cellular telecommunication network according to prior art,

Figure 2 illustrates one example of selection of bearers to be serviced according to an advantageous embodiment of the invention,

Figure 3 illustrates one example of signalling according to an advantageous embodiment of the invention,

Figure 4 illustrates one example of a telecommunications system and a radio network controller according to the invention.

Same reference identifiers are used for similar entities in the figures.

DETAILED DESCRIPTION

According to an advantageous embodiment of the invention, a two-level priority scheme is used. For each client identity, an absolute priority value is assigned, and for each bearer, a relative priority value. Such a two-level priority scheme using two priority data items allows on the one hand treatment of all bearers of a client identity as a single unit on a client-by-client basis, and on the other hand treatment of all bearers of all client identities on a bearer-by-bearer basis.

Treatment of all bearers of a client identity as a single unit can be effected by using only one of the priority values as the basis for bearer servicing decisions. Preferably, the absolute priority associated with the client identity is used as the basis for decisions. Treatment of all bearers of a client identity as a single group is useful e.g. in handover situations, when the network decides, whether or not to allow a handover to occur.

In some situations it is advantageous to prioritize the use of transmission capacity on a bearer-by-bearer basis. In such cases, both the absolute and the relative prioritization can be used for selecting the bearers to be dropped first. Advantageously, those bearers which have the lowest relative priority of the client identities having lowest absolute priority, are dropped first. Such an approach is advantageous for example in air interface congestion situations.

The client identity referred to in the previous paragraphs is in an advantageous embodiment of an invention the identity of a single USIM, as the following examples in the description of various figures of this specification show. However, the invention is not limited to such an embodiment. A client identity can also comprise multiple USIMs. For example, a client identity may also refer to a single

ME having multiple USIMs, whereby the client identity comprises multiple USIM identities.

The absolute priority value of each USIM may advantageously be stored in the USIM. The absolute priority value may be different between different USIMs, also in cases where a single ME comprises more than one USIMs. Further, an operator may set the price of an USIM according to the absolute priority level of the USIM. The absolute priority is preferably the same for all bearers associated with the same USIM. The relative priority value can advantageously be used to distinguish the bearers associated with the same USIM. This relative priority value of each bearer can advantageously be assigned automatically during the setup of the bearer, for example, by the call control entity for that particular USIM.

Figure 2 illustrates selection of serviced bearers according to an advantageous embodiment of the invention. Figure 2 shows three mobile communication means ME1, ME2, ME3 which already have connections to a base station. In this example, we assume that the base station is able to support eight bearers. As shown in Figure 2, the first mobile ME1 has two USIMs USIM11, USIM12, the second mobile ME2 one USIM USIM21 and the third mobile ME3 one USIM USIM31. In the initial situation as shown by the left side of the figure, the first mobile ME1 has four bearers, three of the bearers associated with the first USIM USIM11 and one with the second USIM USIM12. The second mobile ME2 has only one bearer, and the third mobile ME3 two bearers. The bearers have two priority levels, the higher level called the absolute priority A3, A5 being associated with the USIM and the lower level called the relative priority R1, R2, R3 being associated with each bearer. As one can see from Figure 2, the three bearers associated with USIM11 have the lowest absolute priority value A5, while the other bearers have a middle priority of A3. In the example of Figure 2, it is assumed that the absolute priority values range from A1 to A5, the latter being the lowest priority.

At this initial situation, a fourth mobile ME4 is switched on, and the user of ME4 wishes to start communication using two bearers for example to have a video telephone call. Consequently, ME4 signals a request to the network to set up two bearers. Alternatively, ME4 could represent a mobile moving from another cell towards the cell servicing ME1, ME2, and ME3, and require a handover.

The selection of bearers may in various embodiments of the invention be different from that shown in the example of Figure 2. In one advantageous embodiment of the invention where all bearers of a client identity such as a USIM are treated in a single group, all bearers of the first USIM USIM11 of ME1 are dropped instead of only one as shown in Figure 2, since they have the lowest absolute priority value of all active bearers and bearer requests.

Advantageously, each USIM has an associated default absolute priority level, which is assigned to each new bearer. In further advantageous embodiments of the invention, a user can change the priority settings of his/her connections to ensure that he/she receives the desired service from the network. Naturally, the network operator may change the charges levied per connection time or per transmitted amount of data as a result of change of priority settings. Advantageously, the user may change the absolute priority level of any of his/her USIMs, and the relative priority level of any active bearer. Further, the user may change the default priority levels, or the desired priority level for the next connection requested. In further advantageous embodiments, the user may change the priorities of currently active bearers during the connection. Changing of priority of currently active bearers is advantageous for example when the user is downloading a large file to the ME, and wishes to speed up the process by temporarily increasing the priority of the bearer.

On the other hand, the network may start to select the bearers to be serviced for many reasons. For example, when the air interface becomes congested at a so called hot spots, for example during mass events when large crowds of people are present at one location, the network may increase the required priority levels to cope with the overload. A further example is a decrease of the capacity of a base station due to e.g. malfunctioning of a transmitter of the base station.

In an overload situation, the network may offer a possibility to the user to choose to increase the priority level and accept higher connection charges in order to avoid termination of his/her connections. In an advantageous embodiment of the invention, the user may set default preferences for his/her USIMs specifying, if and within which limits the priority levels of the user's connections may be automatically changed during overload situations.

In various embodiments of the invention, the user may adjust any of the priority values. The user may, for example, increase the absolute priority values to increase

the service level of all of his bearers. Naturally, the network operator may adjust the charges accordingly.

In one advantageous embodiment, the operator may set a required minimum priority for a certain cell or for any number of cells or even for the whole network, which minimum priority must be matched or exceeded in order to obtain any service from the network.

In another advantageous embodiment of the invention, the bearer request does not contain an explicit indication of a priority. Instead, the network chooses the priority based on the information contained in the bearer request, for example the type of bearer requested. For example, if the user requests an expensive service, the network chooses a relatively high priority to be used for that bearer.

As previously described, a user may advantageously change the priority values during a connection. For example, during a multimedia session different multimedia components, each one forming a separate bearer, are often added or removed, whereby the preferences given at call setup may no longer correspond to the current wish of the user. The user may therefore wish to modify the relative priority of his/her bearers. One example of a signalling procedure for priority modification according to an advantageous embodiment of the invention is shown in Figure 3. The connections are controlled by the Call Control (CC) entities in the core network. The decisions on whether or not to provide radio service for a bearer are made in the radio access network RAN. The priority values are stored in the RAN. Figure 3 shows the signalling between a call control entity ME-CC 10 in a mobile communication means, a corresponding peer entity CN-CC 20 in the core network, and the radio access network RAN 30. After the user instructs the mobile communication means to increase the priority of a bearer, the ME-CC 10 sends a MODIFY_REQUEST message 110 to the CN-CC 20. The CN-CC invokes a priority modification procedure in the radio access network RAN 30 by sending a

MODIFY_PRIORITY message 120 to the radio access network RAN 30. After receiving the MODIFY_PRIORITY command, the radio access network modifies 130 the priority of the bearer as desired. When the radio access network has completed the priority modification, it sends 140 an acknowledgement MODIFY_PRIORITY_ACK message back to CN-CC. The CN-CC finishes the messaging by sending 150 an acknowledgement MODIFY_REQUEST_ACK message to ME-CC.

A terminal can modify several bearers substantially simultaneously by initiating the negotiation procedure separately for each bearer in succession. In another advantageous embodiment, a list of bearer identities is attached as a parameter to the MODIFY_REQUEST message.

Fig. 4 shows an example of a telecommunications system and a radio network controller according to the invention. The radio network comprises radio network controllers RNC1, RNC2 and RNC3. Base stations BS1, BS2 and BS3 are controlled by the radio network controller RNC0, base stations BS4, BS5 and BS6 are controlled by the radio network controller RNC1, and base stations BS7, BS8 and BS9 are controlled by the radio network controller RNC2. A mobile equipment ME is connected by radio to the system, via the base stations and radio network controllers. In Fig. 4 the base station BS5 is active, ie. the data transfer between the system and the mobile equipment is routed via the base station BS5. There can also be several active base stations, if macro diversity is used. It should be noted that Fig. 4 shows only a fraction of the usual number of radio network controllers and base stations in a radio network.

The radio network controller may comprise the following logical units. The logical link control LLC controls the radio connections between the radio network controller and a mobile equipment. The tasks of the logical link control LLC may include error detection, error correction and retransmission in error situations. In

addition, the logical link control LLC may comprise control for the necessary buffers and acknowledge windows. The macrodiversity controller MDC performs the functions that belong to macrodiversity combining according to the possible macrodiversity implementation used. The set controller SC controls the active set of base stations. The radio network controller according to the invention also comprises means PM for associating priority data items with a bearer, and means DM for making decisions whether or not to provide services for the bearer based on the value of the priority data items. The means PM and DM can be realized as parts of other logical means of the radio network controller, or they can be separate logical means in the radio network controller.

The invention is not limited to using a two-level priority scheme as explained in the previous examples. For example, in an advantageous embodiment of the invention, a three-level priority scheme is used, i.e. three priority data items are associated with each bearer. In such an embodiment, the highest level priority value is associated with the ME, the middle level priority value is associated with each USIM connected with the ME, and the lowest level priority value is associated with the bearers of the USIMs. In such an embodiment, the selection of bearers to be serviced may proceed in a way analogous to the selection in a two-level scheme, e.g. starting the dropping of bearers from that group of bearers which has lowest values of the two higher priority levels, and dropping first those bearers having the lowest bearer-associated priority level. Further, a three-level priority scheme is advantageous for example when a ME comprising more than one USIM attempts to perform a handover to another cell. In such a situation it is advantageous, that all bearers of the ME can be treated as a single group when the network determines, whether or not to allow the handover to occur. In such a situation the ME advantageously has a priority value associated to it, which value is used by the network in said determination.

The priority scheme according to the invention can also be used in other situations than network overload situations. For example, instead of affecting the selection of bearers denied or allowed, the priorities may also affect the service level such as transmission capacity allocated for a bearer. For example, by setting the priority levels of his bearers high enough, the user may obtain better and faster service than other users with lower priority levels. With the inventive priority scheme, a user may obtain almost any service level he desires, and can adjust the obtained service level at any time by adjusting the priority values. The priority scheme further allows the network to reduce the level of service given to bearers having low priority, and thus avoid an overload situation altogether.

The name of a given functional entity, such as the radio network controller, is often different in the context of different cellular telecommunication systems. For example, in the GSM system the functional entity corresponding to a radio network (RNC) is the base station controller (BSC). Further, the various command names such as the MODIFY_REQUEST command name are intended to be examples only, and the invention is not limited to using the command names recited in this specification.

In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention.

Claims

1. A method for management of bearers in a cellular telecommunications system, **characterized** in that

- at least two priority data items are associated with each bearer, the first one of the priority data items having a same value for at least two beareers associated under the same client identity, and
- decisions whether or not to provide services for a bearer are based at least in part on the value of at least one of said at least two priority data items.

2. A method according to Claim 1, **characterized** in that the bearers are organized into sets on at least two hierarchical levels and a priority data item is given for each set.

3. A method according to Claim 2, **characterized** in that one of the hierarchical levels is the level of one bearer, and the sets on that level comprise one bearer.

4. A method according to any of the preceding Claims, **characterized** in that one of the hierarchical levels is the level of client identity, and the sets on that level comprise the bearers of that client identity.

5. A method according to any of the preceding Claims, **characterized** in that

- at least two sets of decisions on providing service are defined,
- a first combination of the priority data items is used in a first set and
- a second combination of the priority data items is used in a second set.

6. A method according to any of the preceding Claims, **characterized** in that all bearers associated with the same client identity have the same values of a first priority data item of said at least two priority data items.

7. A method according to Claim 6, **characterized** in that the value of the first priority data item is stored in the USIM.

8. A method according to Claim 6 or 7, **characterized** in that said client identity is the identity of a USIM.

9. A method according to any of the preceding Claims, **characterized** in that at least one of the priority data items is allocated during the bearer setup procedure.

10. A method according to any of the preceding Claims, **characterized** in that at least one priority data item is changed during the connection.

11. A method according to Claim 9 or 10, **characterized** in that the priority data item is determined by the mobile station.

12. A method according to Claim 9 or 10, **characterized** in that the priority data item is determined by the network.

13. A method according to any of the preceding Claims in a telecommunications system comprising a radio access network, a core network and a mobile equipment wherein

- the decisions on whether or not to provide the radio service for the connection are made in the radio access network and

- the priority items are stored in the radio access network,

characterized in that

the mobile equipment sends the core network entity controlling the bearer a request to change the value of a priority data item and the core network requests the radio access network to change the value of the priority data item.

14. A method according to any of the preceding Claims, **characterized** in that at least a required minimum value for a priority data item is defined and the bearers having a priority data item value smaller than the required minimum priority value are not given resources.

15. A cellular telecommunications system, **characterized** in that for management of bearers

- at least two priority data items are arranged to be associated with each bearer, the first one of the priority data items having a same value for at least two bearers associated under the same client identity, and
- decisions whether or not to provide services for a bearer are arranged to be based at least in part on the value of at least one of said at least two priority data items.

16. A cellular telecommunications system according to Claim 15, **characterized** in that the bearers are organized into sets on at least two hierarchical levels and a priority data item is given for each set.

17. A cellular telecommunications system according to Claim 15 or 16, **characterized** in that

- at least two sets of decisions on providing service are defined,
- a first combination of the priority data items is used in a first set and
- a second combination of the priority data items is used in a second set.

18. A radio network controller for a cellular telecommunications system, **characterized** in that for management of bearers it comprises

- means for associating at least two priority data items with each bearer, the first one of the priority data items having a same value for at least two bearers associated under the same client identity, and

- means for making decisions whether or not to provide services for a bearer based at least in part on the value of at least one of said at least two priority data items.

19. A radio network controller according to Claim 18, **characterized** in that it comprises means for organizing the bearers into sets on at least two hierarchical levels and for giving a priority data item for each set.

20. A radio network controller according to Claim 18 or 19, **characterized** in that it comprises

- means for defining at least two sets of decisions on providing service,
- means for using a first combination of the priority data items in a first set and
- means for using a second combination of the priority data items in a second set.

ABSTRACT

The invention is directed to a method for management of bearers in cellular telecommunication systems in such a situation, when the demand of services is greater than the capacity of the network to provide such services. According to the invention, a set of priority values is associated with each bearer. Preferably, the set of priority values comprises an absolute priority value, which is the same for all bearers associated with a certain USIM, and a relative priority value, which defines the priority order of the bearers associated with a certain USIM. The network uses these priority values to determine, which bearer is dropped, when not enough resources are available.

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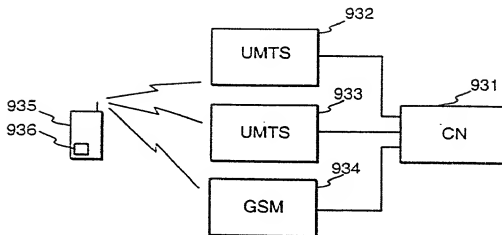


Fig. 1

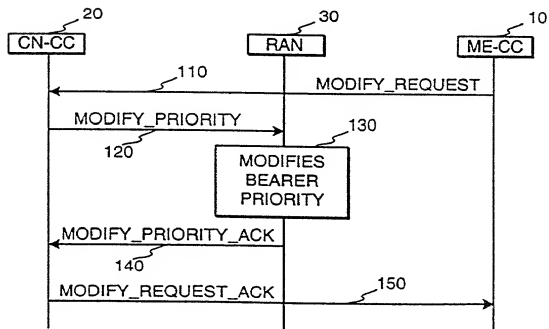


Fig. 3

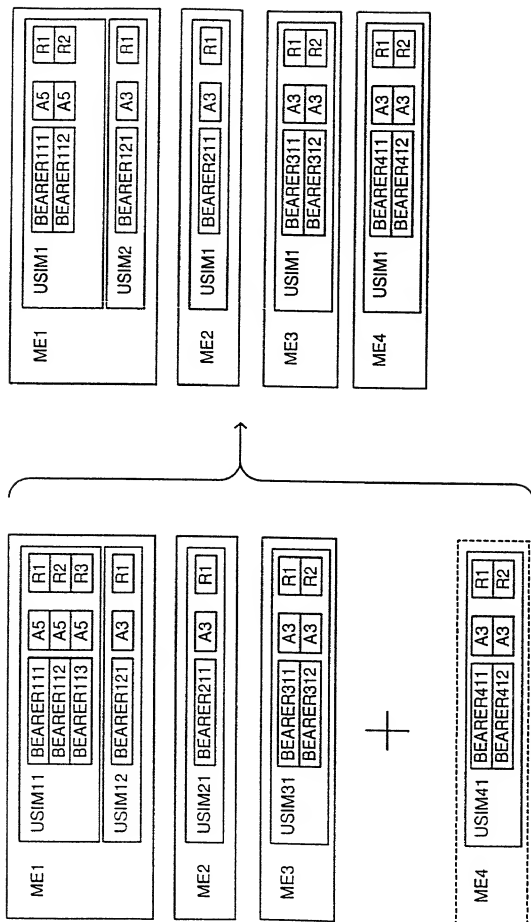


Fig. 2

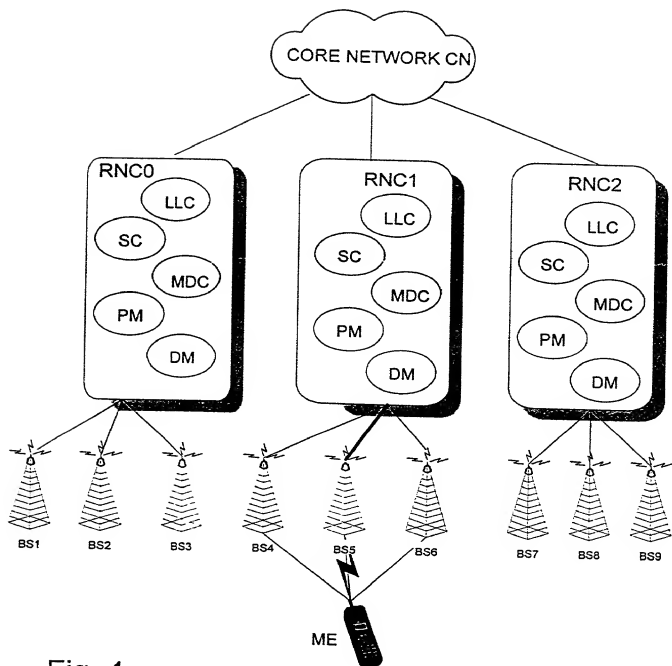


Fig. 4

SPECIFICATION IDENTIFICATION

the specification of which:

(complete (a), (b) or (c))

(a) ☐ is attached hereto.

(b) ☒ was filed on _____, as Serial No. 09/744,180
or ☐ Express Mail No., as Serial No. not yet known _____
and was amended on _____ *(if applicable)*.

NOTE: Amendments filed after the original papers are deposited with the PTO that contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 CFR 1.67.

(c) ☒ was described and claimed in PCT International Application No. PCT/FI99/00636,
filed on 22 July 1999, and as amended under PCT Article 19 on
_____ *(if any)*.

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, § 1.56,

(also check the following items, if desired)

☒ and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and

☐ in compliance with this duty, there is attached an information disclosure statement, in accordance with 37 CFR 1.98.

PRIORITY CLAIM (35 U.S.C. § 119(a)-(d))

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

(complete (d) or (e))

(d) ☐ no such applications have been filed.

(e) ☒ such applications have been filed as follows.

NOTE: Where item (c) is entered above and the International Application which designated the U.S. itself claimed priority check item (e), enter the details below and make the priority claim.

09744180-033001

**ALL FOREIGN APPLICATION(S), IF ANY, FILED MORE THAN 12 MONTHS
(6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION**

NOTE: If the application filed more than 12 months from the filing date of this application is a PCT filing forming the basis for this application entering the United States as (1) the national stage, or (2) a continuation, divisional, or continuation-in-part, then also complete **ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR C-I-P APPLICATION** for benefit of the prior U.S. or PCT application(s) under 35 U.S.C. § 120.

POWER OF ATTORNEY

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

(list name and registration number)

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- ☐ Attached, as part of this declaration and power of attorney, is the authorization of the above-named attorney(s) to accept and follow instructions from my representative(s).

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Customer No. 2512

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

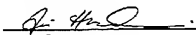
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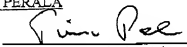
NOTE: Carefully indicate the family (or last) name, as it should appear on the filing receipt and all other documents

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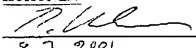
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*(check proper box(es) for any of the following added page(s)
that form a part of this declaration)*

☒ Signature for fifth and subsequent joint inventors. Number of pages added 1.

☐ Signature by administrator(trix), executor(trix) or legal representative for deceased or incapacitated inventor. Number of pages added _____.

☐ Signature for inventor who refuses to sign or cannot be reached by person authorized under 37 CFR 1.47. Number of pages added _____.

☐ Added page for signature by one joint inventor on behalf of deceased inventor(s) where legal representative cannot be appointed in time. (37 CFR 1.47)

☐ Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (C-I-P) application.

Number of pages added _____

☐ Authorization of attorney(s) to accept and follow instructions from representative.

*(if no further pages form a part of this Declaration,
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